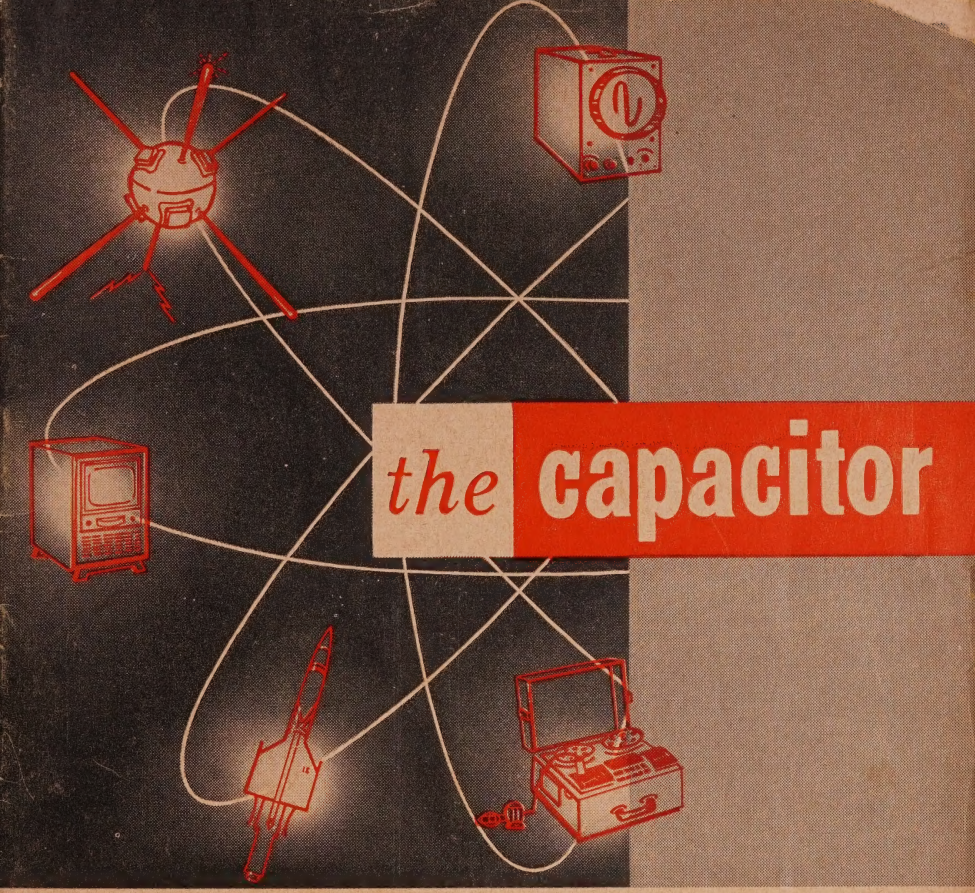

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ELECTRONIC COUNTER

The area of application for electronic counting devices is not only large but steadily growing. Two decades ago, the sole industrial use was object counting. With the rapid expansion of electronics into other fields, both scientific and industrial, however, the counting of many kinds of regular and random events has been turned over to these devices. The electronic counter, unhampered by inertia, can operate at speeds far beyond the upper limits of the fastest mechanical counter and requires insignificant signal power.

Starting with the prosaic task of object counting, the long list of modern counter applications would fill several pages and would touch upon radioactivity, digital computers, frequency measurement, speed checking, voltage, current, and resistance measurement, totalizing events per unit time, measurement and indication of time intervals, predetermined counting, etc. Virtually every branch of science and industry has some use for the high-speed counter.

It is not the purpose of this article to review the applications of counting devices, but to describe the fundamental circuits used in modern counters. This survey is necessarily brief but is aimed to give the general electronics technician an over-all view of this special equipment.

Flip-Flop Element

Just as gears and ratchets are the basic elements in certain mechanical counters, the bistable multivibrator, or flip-flop, is the fundamental building block of the most widely used digital electronic counter systems. Although the flip-flop was invented approximately forty years ago, it did not come into widespread use until the advent of high-speed electronic counters.

The flip-flop is a fully electronic switch. A signal (trigger) pulse applied to its input will switch its output ON, whereupon it will remain ON until a subsequent pulse switches it OFF. The output then will remain OFF until another pulse arrives to switch it ON again. The circuit thus is stable-on or stable-off and acts as a counter of the activating signal pulses. The same operation could be performed, of course, with electromechanical latching relays (which are also bistable devices) but not at the tremendous speeds and low signal power offered by electronic circuits.

Figure 1 shows the basic arrangement of tube and transistorized flip-flop circuits. These circuits operate in a similar manner. Referring to Figure 1(A): when power is applied to the circuit, one tube will conduct more plate current than the other. This condition may result from slight assymetry or from a momentary transient. Assume that V_1 has the higher conduction. The lower current of V_2 means less voltage drop across R_5, therefore the plate of V_2 is closer to the B+ voltage. This causes a positive voltage to be applied to the grid of V_1 through the voltage divider R_6–R_3, which increases the V_1 plate current still further. The heavy plate current of V_1 increases the drop across R_1, and this lowers the positive voltage applied to the grid of V_2 through the voltage divider R_2–R_7. Since the voltage on this grid thus becomes more negative, the plate current of V_2 decreases still further. This action increases rapidly until V_1 draws the maximum plate current permitted by the limiting effect of R_1. The net result is that V_1 is conducting and V_2 cut off. This is one of the two stable states of the circuit.

Now, if a trigger pulse is applied momentarily to the INPUT terminals (with the upper terminal negative), additional current will flow through R_4 and the pulse source, and the resulting voltage drop across R_4 momentarily lowers the voltage at the junction of R_1 and R_4. This causes V_1 to draw somewhat less plate current, and the plate of V_1 rises

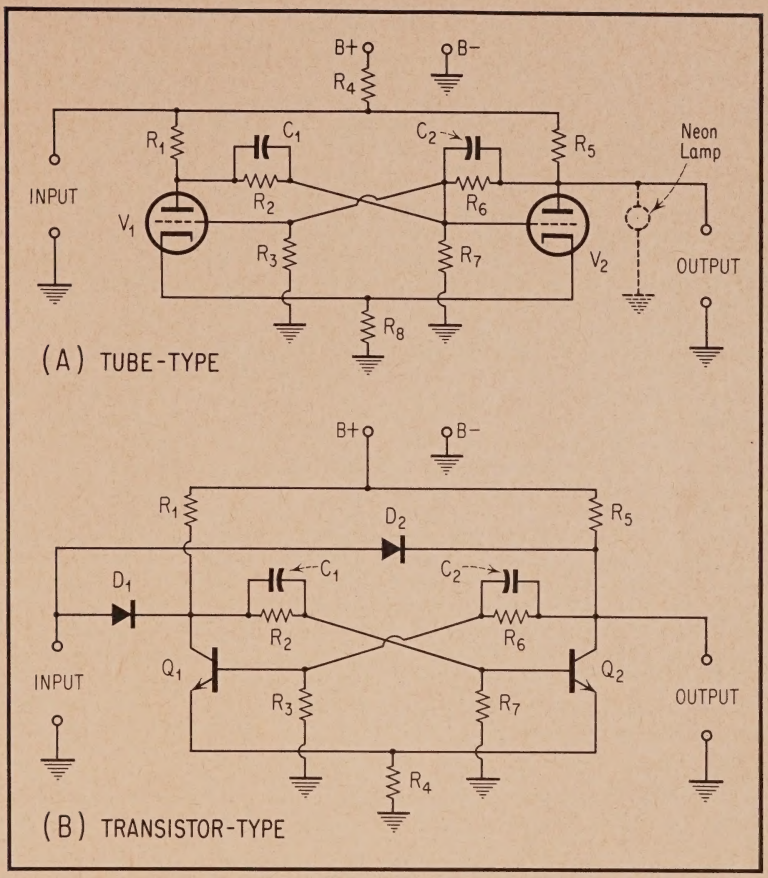

Fig. 1. Basic Flip-Flops.

toward the B+ voltage. The bias voltage applied to V_2 through the voltage divider R_2–R_7 accordingly becomes more positive, causing V_2 to draw more plate current. This, in turn, lowers the drop across R_5 and reduces the positive voltage applied to the grid of V_1 through R_6–R_3. And this action causes V_1 to draw still less plate current. Thus, V_1 draws increasingly less and V_2 increasingly more plate current. The net result is that the trigger pulse rapidly "flips" V_2 into conduction and V_2 OFF. This is the other stable state of the circuit. The commutating capacitors C_1 and C_2 speed up the flip-flop action.

From this basic action of the flip-flop, it is seen that in response to a string of pulses, V_1 is ON half of the time and V_2 half of the time. If output is taken from only one of the tubes, as shown in Figure 1(A), the output voltage will ON

(high) in response to only every other input pulse. Thus, the flip-flop is a **scale-of-2** counter; that is, the number of output pulses equals one-half the number of input pulses. A neon lamp connected between the V_2 plate and ground will glow in response to every second input pulse.

The transistorized circuit (Figure 1B) is similar to the tube-type, with the collector replacing the plate, emitter the cathode, and base the grid. Using NPN transistors as shown, the circuit requires steering diodes D_1 and D_2 for the positive trigger pulse. The diodes are poled to conduct the pulse to both plates readily through the low forward diode resistance but to prevent short circuit of the collectors (plates), since the collectors see the high inverse diode resistance. If high-voltage transistors are employed, a neon lamp may be used as an output indicator, as in tube-type flip-flops. But if the more common low-voltage transistors are used, some other device may be necessary. (Low-current filamentary lamps are available, and neon lamps sometimes are used with an extra transistor as a d c amplifier.)

These are the circuits which are most widely used at this writing, but flip-flops have been made with 4-layer diodes, double-base diodes (unijunction transistors), tunnel diodes, neon lamps, trigistors, magnistors, ferroresonant inductors, ferroelectric capacitors, ferrite cores, magnetic amplifiers, varactors, and electromechanical relays.

Scaler Systems

Flip-flops may be combined in numerous ways for specific counting jobs. If they are cascaded, as in the conventional RC-coupled amplifier, each stage after the first will receive a trigger pulse for each second pulse received by the preceding stage. Thus, a 2-stage counter will deliver one output pulse for every 4 input pulses, a 3-stage counter one output for each 8 input, and so on. That is, the circuit being bistable (base = 2) will divide the input number by the factor 2^n, where n is the number of flip-flops. If four stages such as shown in Figure 1(A) are cascaded, the lamp in the last stage will light once for each 16 input pulses. To determine the total number of input pulses which have passed, it is necessary only to note the **last** lighted lamp in the string; thus, in a 4-stage counter, the last (fourth) lamp indicates a

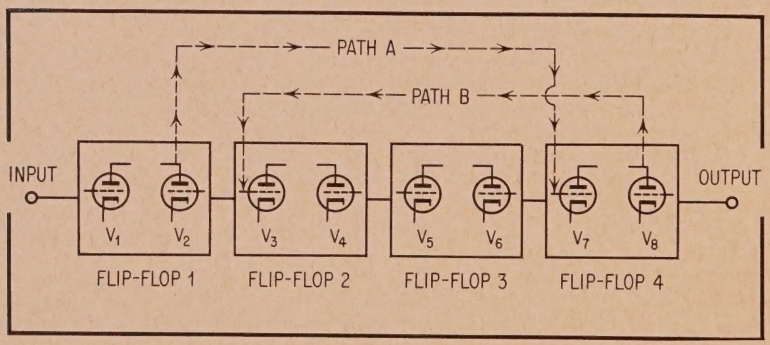

Fig. 2. Arrangement of Decimal Scaler.

count of 16, the third lamp 8, second 4, and first 2.

Such cascaded arrangements are termed **scalers.** The type just described is a **binary** scaler because its number base is 2. Such counters have many applications but since our common counting scheme is decimal (i.e., base = 10), greater convenience is provided by a counter based on this latter scheme. That is, we prefer a **decade** scaler, which counts 0, 1, 2, 3, 4, 5 6, 7, 8, 9 instead of the binary count 0, 2, 4, 8, 16. However, these decimal indications must be obtained with flip-flops which are base-2 devices. How this may be accomplished is discussed below.

See Figure 2. Without paths A and B, the unit is the type of scaler previously described, which counts to 16. When the paths are added, the input pulses operate the circuit in the normal manner up to the 9th pulse. The 10th pulse flips V_2 ON and this sends a negative-going voltage over path A to cut off V_7 and switch V_8 over. (Although V_2 is ON also at the 2nd, 4th, 6th and 8th pulses, the path-A signal can have no effect on V_7 until the tenth pulse.) Now, ordinarily the output pulse from V_2 would switch V_3 ON, but a negative-going voltage (fed back over path B from V_8 to the V_3 grid at the tenth pulse) bucks the signal from V_2 and maintains V_3 OFF. As a result, V_3 receives no signal and so remain OFF. At the tenth pulse, all flip-flops are OFF.

Four flip-flops arranged in this manner constitute a counter decade. The count may be indicated with ten neon lamps (numbered 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9), with the lighted lamp indicating the count. But the lamps must be connected in such a way that only the appropriate lamps will light for a particular count.

Figure 3 shows the circuit of a single, tube-type counter decade consisting of our identical flip-flops. Note the connection of the ten lamps in a bank with the odd-numbered ones in one line and the even-numbered ones in the other. In this circuit, the internal auxiliary paths are provided by C_{11}–R_{34} and C_{14}–R_{47}. Figure 4 shows a comparable transistorized counter decade using high-voltage switching transistors, such as RCA 2N398. In this circuit, the feedback paths are provided by diodes D_3 and D_6. The auxiliary d c voltages, E_1 and E_2, bias the lamps so that they are readily fired by the collector-voltage shifts. Closing the reset switch, S, "erases" the count; i.e., sets the counter back to zero. (This feature may be provided in the tube circuit by returning grid resistors R_{10}, R_{19}, R_{30}, and R_{42} to a common resistor, such as R_{10} in Figure 4, shunted by a grounding switch, instead of grounding them separately as shown.)

In a complete counter, several decades of the type shown in Figure 3 or Figure 4 are cascaded for higher counts. Thus, a four-decade counter provides a count of units in the first decade, tens in the second, thousands in the third, and ten thousands in the fourth.

A complete counter of this type sometimes is provided with a timing circuit for halting the count after an accurately-determined interval such as 0.1, 1, or 10 seconds. This enables a precise count to be made of the number of events (pulses) occurring in the unit time. Among the uses of such an instrument is the indication of frequency (cycles or pulses per second). Both regular and random pulses may be counted.

Whereas many decade scalers employ neon lamps, arranged vertically in decades, as indicators, some make use of numerical indicator tubes. These are gaseous tubes which either display an actual figure (0 to 9) or give a glowing dot to signal one of the figures (0 to 9) arranged in a circle on the instrument panel.

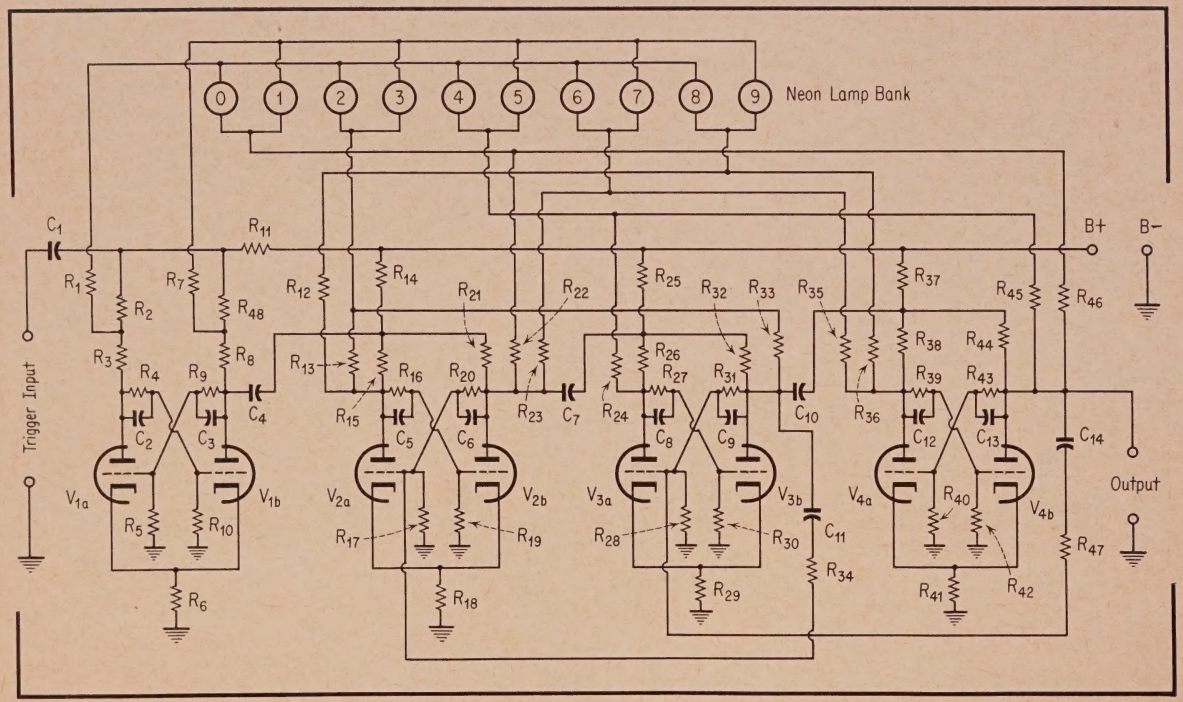

Fig. 3. Tube-Type Decimal Scaler.

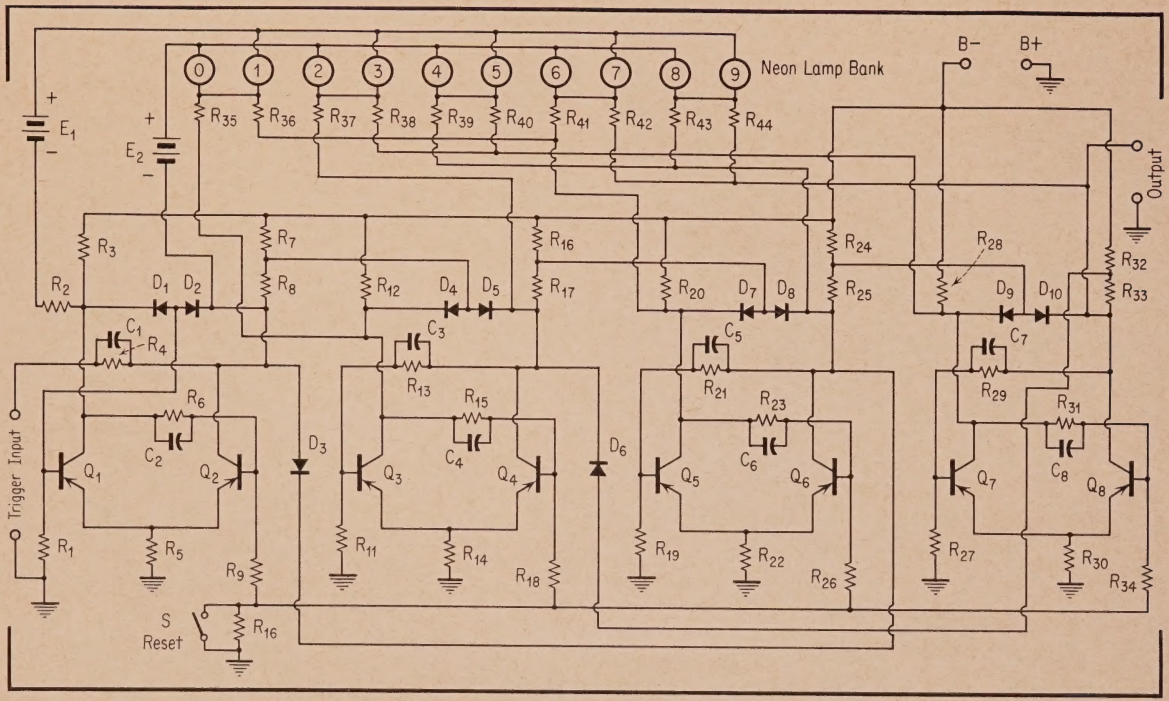

Fig. 4. Transistorized Decimal Scaler.

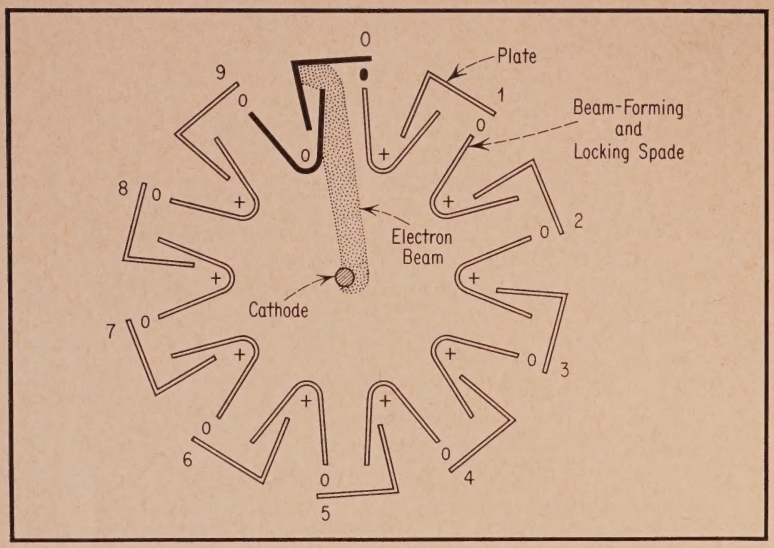

Fig. 5. Details of Beam Switching Tube.

Beam Switching Tube Decade

The Burroughs beam switching tube provides a fast and relatively simple means of decade counting. The basic structure of this tube is illustrated by Figure 5.

In this vacuum tube, which is a type of magnetron, ten sets of elements are spaced radially around a central cathode. Each set consists of a grid, plate, and spade. A strong permanent magnet surrounds the outside of the envelope and provides an axial magnetic field through the tube. The spades and plates are connected to the supply voltage through individual series resistors. The crossed magnetic and electrostatic fields give the spade a negative resistance characteristic, and this characteristic provides bistability.

Under quiescent conditions when power is applied to the tube, there is no electron beam. If the voltage of a given spade is reduced, by means of dc or a pulse, to bring the spade characteristic into its negative resistance region, the beam will form between the cathode and that spade. If nothing further is done, the beam will remain in that position (such as at the "0" elements in Figure 5) until the power is interrupted. But the beam may also be advanced to the next position. Thus, if a suitable pulse is applied to the grid so that the grid voltage is lowered, the electrostatic field between the adjacent spades will be reduced and the beam will switch to the next set of elements (as to the "1" set in Figure 5). In this way, the beam may be stepped sequentially around the ring of elements from 0 to 9. Indicators connected to the plates will show the location of the beam at any instant, and a counter decade consequently is obtained . The switching action is very fast, 0.1 microsecond being specified.

Figure 6 shows bow a beam switching tube (V_2) may be operated with a numerical indicator tube (V_1) to provide a complete high-speed counter decade. As in other counters, these decades may be cascaded for a higher total count.

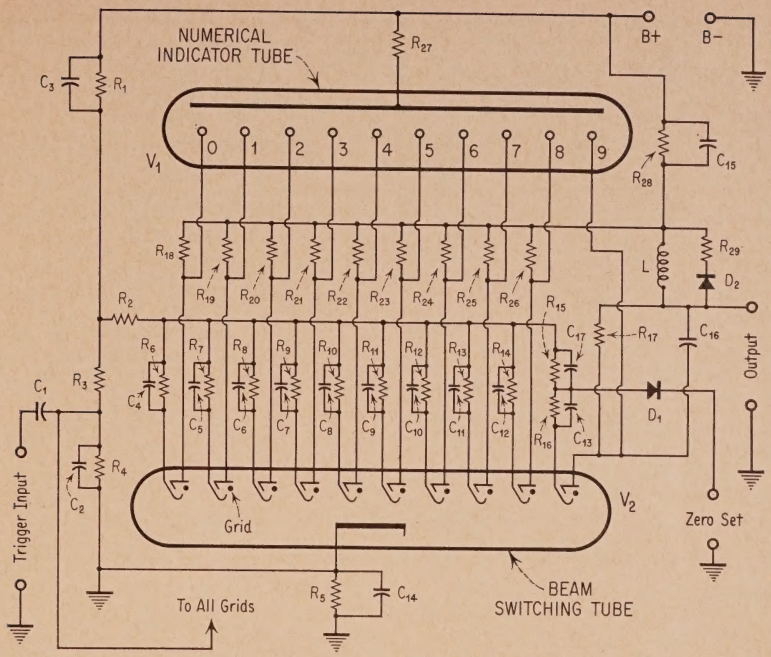

Fig. 6. Beam-Switching Counter Decade.

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12. C-D CAPACITOR, February, 1956; August, 1957; January, 1958.

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FOR SALE — Radio headsets: Trimm and Brandes high res. type, like new cond., heavy-duty chrome plated xmtr. key, all for $5 cash. No trades. Frank Wooley, Apt. 6B, 9 Berkley Terr., Irvington, N. J.

SELL OR TRADE — Hallicrafters S-36, S-37, SX-28 rcvrs.; BC-375E, complete with all coils; old Westinghouse radio; other items. Want power supply for BC-669; marine depth indicator; boat transceiver; boat clocks and other marine instruments. William Hansen, 165 Silverbrook Ave., Niles, Mich.

WANTED — Any or all PF Reporter magazines: Nov. and Dec., 1954; Feb., 55; Apr. through Oct., 55; Jan., 57; Feb., 57. Al Hruska, R. 3, Box 239, Lake Charles, La.

SELL OR TRADE — 8XP4 test pix tube in aluminum case with hinged plexiglas front for easy removal, universal yoke, like new (value $25), or swap for commercial R.F. wattmeter; 3" scope; Panadoptor; SWR bridge; Matchbox; microammeters. Don Cox, 2912 Madison Ave., Evansville 14, Ind.

FOR SALE — Pair 4Cx300A tubes with SK-700 sockets and SK-606 air chimneys, unused, in original cartons, $25 each set. H. Goldstein, 62 Aster Dr., New Hyde Park, N. Y.

WANTED — GE "TV Principles and Practice" home study course in lesson form, complete. Albert T. Warreck, R. 4, Lockport, N. Y.

FOR SALE — Unused Webcor motor, 4-pole heavy-duty induction type, electronically balanced, for all 2800, 2900 and late model Webcor tape recorders (including 3-speed), $10. Ken Sable, 39-40 Greenpoint Ave., Long Island City, N. Y.

FOR SALE — Books: Sams TV Tube Location Guides, TGL 1, 2, 3, 4; Riders TV Trouble Cures, Vol. 5; Audel's TV Service Manual; RCA Pict-O-Guide, Vol. 3; Cisin's TV Tube Locator, 1954. All for $5.50. Lewis Grabsky, 566 Castleton Ave., Staten Island 1, N. Y.

MUST SELL ALL — Tubes, parts, in radio-TV service shop. Write making offer on what you want. Luther Howard, 6082 Crestwood Dr., Kalamazoo 2, Mich.

FOR SALE — Triplett 3413A tube tester with adaptor for testing picture tubes, guaranteed OK, $50; several tuners and power transformers from salvaged sets, $5 each. C. Wingrove, 172 E. Askren St., Uniontown, Pa.

FOR SALE — Hickok 605A tube tester with built-in VOM and capacity checker, factory overhauled, fine condition, up to date roll chart, instructions, and new test leads, $100 or best offer. Carlan Hans, R. 2, Edwardsville, Ill.

WANTED — NC-125 in good cond. Pay or swap plus cash for test equip. T. Ferguson, 184 E. 101 St., New York 29, N. Y.

WANTED — Index to Riders Radio Trouble-shooters manuals, 16 to 21, or complete index. E. S. Priem, 1104 Seagle Bldg., Gainesville, Fla.

WANTED — Riders TV manuals, No.'s 19 and up. Will pay $10 apiece. Must have index highest number. Calumet TV Service, 472 Jackson St., Gary, Ind.

WANTED — Hallicrafters SM40 tuning "S" meter. Must be in operating condition. State price. T. J. Dowler, Box 27, Oceola, Ohio.

FOR SALE — ARC-4 xmtr. with tubes, $7; DM-42, $5; Mobile xmtr., 30 to 42 mcs., 6 v., $5; 12 mmfd. 20,000 v. vacuum cond., $2.50; home brew 10 mtr. 3 el. beam, $10. Thomas A. Koscica, 226 Eastern Parkway, Irvington 11, N. J.

FOR CASH — DX-100, HQ-100, 15KSR, complete, $150; 6-12 v. GE transceiver, 460 mc., $25; 6 v. 30 w. 43 mc. Motorola trans. with manual, $15; 75m., 6 v., 20 w. home brew mobile complete, $15. You pay freight. J. Humphrey, 2449 N. 38th St., Milwaukee 10, Wis.

WANTED — Binders for QST and CQ magazines; old battery radio receivers, transmitters, and other early wireless gear. David T. McKenzie, 406 So. Main St., Leon, Iowa.

SELL — Hallicrafters SX-110 receiver with manual, used only a few hours, $135, plus 30 lbs. postage. William Meyer, Rt. 3, Box 133, Palmdale, Calif.

FOR SALE — Arvin 6-tube FM radio 13" x 5¼" x 4½" in pink and white, like new, $28. Newhall Yee, 72 W. 95 St., New York 25, N. Y.

FOR SALE — EMC VTVM, $10, signal generator, $10. Work needed on both for perfect operation. Louis Cane, 212 Rogers Ave., Endicott, N. Y .

FOR SALE — CQ for 1945, January thru November. Make offer. J. E. Williams, Box 396, Hornell, N. Y.

FOR SALE — Valiant factory wired; Hi-gain 10, 15, 20 vertical, ARC 5s, 10, 40, 75; S-38 rcvr.; CDR AR-22 rotor with control box and cable. Best offer on any or all. Ron Marx, 1307 Ed. L. Grant Hyway, Bronx 52, N. Y.

TRADE — Webcor 2020 portable tape recorder, dual speed, dual track, mint condition. Want Riders TV manuals. Mike Cory, 4168 Harrison St., Bellaire, Ohio.

SELL OR TRADE — 2 Dynamotors, 9 v. in, 450 v. out; and DM40A 12 v. in, 172 v. out, 138 ma. Want PE133 dynamotor, 12 v., 2.3 amp. in, 250 v DC, 90 ma. out., or equivalent. W. E. Fuller, R. 1, Dimondale, Mich.

FOR SALE — Triplett tester 1175B, has sig. generator, 130 KC to 28 MC, CC and DC volt and ohms. William Bechtel, 1155 Spann Ave., Indianapolis, Ind.

FOR SALE — Pilot 17" TV console 2-door, mahogany, 1950, double tuning chassis, TV channels and FM 80-108 mc., Jensen extended range speaker. TV set needs some repairs. Make offer. P. Siegel, 354 So. First St., Brooklyn 11, N. Y.

FOR SALE — Sylvania king-size tube tool caddy and Eico 221 VTVM with instructions. Both $28. Metropolitan area only. Seymour Needelman, 4910 Snyder Ave., Brooklyn 3, N. Y.

WANTED — Seattle area, 17" table model TV cabinet for Admiral 17DX12. Set from early 50's. H. A. McNeill, 263 4th St., Bremerton, Wash.

FOR SALE — Precise 904-K VTVM with tilting meter and 'lead magician' switch, very good condition. Best offer over $35. Carl Herman, RD 2, Hamilton, N. Y.

FOR SALE — Sylvania TV set schematic diagrams for over 5 years, for best offer; over 100 pcs. mixed TV and radio parts, $1 while they last. George's Appliance Repair, 9226 Merlin Dr., Pittsburgh 37, Pa.

FOR SALE — Eico 315 signal generator, $25; Dumont 20B 5" scope, $49; Ampro 730 single speed, dual-track tape recorder, $39. All FOB. H. Bell, 3917 Ely Ave., New York 66, N. Y.

WANTED — Books on radio and TV servicing and troubleshooting, test equip., old issues outdoor magazines, etc. Lester Zebro, R. 2, Boyceville, Wis.

FOR SALE — Tubes, transformers, relays, crystals and surplus military equip. and parts. Send for list. John Miller, 45 Park St., Hanson, Mass.

FOR SALE — B.T. 99 UHF converter, like new, $8; Hercules DC power supply, 105-136 v., 200 ma., $6; Willard 2 v. dry charged batteries, 20 AH, $2.50 Eric Scholer, 209 Glengary Rd., Schenectady 4, N. Y.

TRADE — Two citizens band transmitter-receivers, 5 tube, 110 v., crystal controlled; Browning L500 shortwave tuner, cost $80, very good condition. Want musical instrument, Hi-Fi, PA amplifier, intercom system or tape recorder. Mosier, 1053 Talbot Ave., Albany 6, Calif.

FOR SALE — Dynakit Mark III amp., $50; Eico HF-85 stereo preamp., $35; Fisher 80-R tuner in mahogany case, $90 FOB. Ken Massey, 3449 Winthrop Ave., Indianapolis 5, Ind.

THRADE — Make offer, 35 phono needles, orig. pkgs.: Fidelitone AC-52, Shure 51F-100, A56U, A53MG, Miller, for Webcor 214, Jenson Royal Nylon sapphire and cutting. Philip J. More, 1633 Monroe St., Evanston, Ill.

FOR SALE — NC-156 Navy 300 kc. to 18 mc receiver, $25; Supreme 599 tube and set tester, $25; Weston 772/777, $15; self-service tube tester with locked cabinet, $75; Heath antennascope, $10. J. E. Howell, Box 73, Folly Beach, S. C.

WANTED — Movie projector. Have FM tuner, new intercom, magazines, test equip. to sell or trade. Cameron C. Steele, R. 1, Shelbyville, Ind.

TRADE OR SELL — G.E. 1R32LA deluxe room air conditioner, like new, 115 v., 12.5 a., ½ hp. Want anything in Hi-Fi. Also need G.D.O., signal gen. Any reasonable offer or trade. Anthony Schultz, 49-15 Skillman Ave., Woodside 77, N. Y.

SELL OR SWAP — Two James B. Lansing theatre speaker systems, mint condition, cost $642, for $190 each or $350 for both or trade for good Berlant 33 recorder. Lt. S. S. Boothe, Box 142, Suffolk AFB, L. I., N. Y.

WANTED — SP400 Hammarlund comm. receiver or older. State condition, any modifications, etc. Cash plus freight. Robert R. Milliron, 35 N. Main St., Wharton, N. J.

WANTED — 1938 Andrea 5" TV receiver; radios, manufactured prior to 1930, may be trademarked FADA or F.A.D. Andrea. B. F. Hagen, 1079 Juneau Ave., Akron 20, Ohio.

FOR SALE — Heathkit: TV sweep gen., TS-4A, $45; Heathkit audio analyzer, AA-1, $45. Both assembled, factory checked, and in good working condition. A. G. Heshmati, Box 4411, Carmel, Calif.

WANTED — International crystal mfg. VFA-1 cascode pre-amp for 6 meters. State price and condition. Laurence Jaffe, 47 Hadwen Rd., Worchester, Mass.

FOR SALE — Ameco Conelrad monitor, $11; Dow TR switch DKC, $10; Johnson 275 w. antenna tuner, like new, with manual, $42.50; NRI Radio-TV Servicing Course with 17" TV and pix tube, $125. Want Webco 80-6M mobile antenna and bumper mount. Will trade. W. L. Patterson, 2161 - 23rd Ave. North, St. Petersburg 13, Fla.

BEST OFFER — EV items, all like new: AM-FM tuner with preamp; 6 HD horn; "Patrician". R. Bailey, 216 Slade Ave., Pikesville 8, Md.

MAKE OFFER — Western Electric 6004-D broadcast receiver with tubes and manual, very good condition; two WD-11's with adapters; WX-12 filaments, OK; SW-3 with coils 10 thru 800 meters, no power supply. L. W. Eldridge, 55 Torrey St., So. Weymouth 90, Mass.

FOR SALE — Electro-Voice 726 mike, $24.50; Thordarson, 25 w. PA amplifier, $75; Magnecorder 10 w. Hi-Fi amplifier, $44.50; 10 w. power amplifier, $9.95; G-E Model A1-901 record filter, $9.95. James E. Humphrey, 1844 Spruce St., Quincy, Ill.

WANTED — G. E. portable radios (batt. AC-DC), models 250 and 260. Working order or not. Cash or will trade for electronic and industrial parts and equip. List sent. G. Kusse, 11630 S.W. Lacey Ct., Portland 23, Ore.

FOR SALE — Globe Chief 90-A with Knight VFO, Eico 730 modulator, B&W low pass filter, and crystal mike, $130 or best offer. L. R. Campbell, 4 Pilling Rd., No. Wilmington, Mass.

FOR SALE — Cushcraft 10 meter beam, 4-element, aluminum, $25; Shure 777 mike and stand, $11. Both like new. John E. Grene, 711-44th St., Rock Island, Ill.

SELL OR SWAP — Racks: ICA, 67½" high, 22" wide, 18" deep; Air-Coupler spkr. enclosure for low frequency response. A. Schnipper, 79 W. 45th St., Bayonne, N. J.

WANTED — Used correspondence course and kits containing enough info to obtain General class ham license. Will rent, buy or swap for stamps and first day covers. Sol P. Baltimore, 19974 Santa Rosa Ave., Detroit 21, Mich.

SELL — Complete station, 10 thru 80, very good cond., in two 68" cabinets: TVI'd monitor scope, VFO phone, CW phone patch, clipper bug, HRO7, Q multiplier, 100 Kc. marker spares. Will not ship. E. Hanlon, 321 Paterson Ave., East Rutherford, N. J.

FOR SALE — 500 w. transmitter in rack cabinet — 16 tubes with 4-125 final, remote VFO, complete metering, rotary inductor Pi output, differential keying, time delay in power supply. Local sale, $100. Hal Skurnick, 134 Elliot Pl., New York 52, N. Y.

FOR SALE — Army type metal mine detector, 8 tubes, with batteries, rugged construction, 20 lbs., like new, with earphones and micrometer, $75 FOB. R. F. Emerson, 1121 Delaware, West Sacramento, Calif.

FOR SALE — Hammarlund HQ-129X rcvr. with speaker, $125; Hallicrafters S-94 rcvr., $45. Both in fine cond. Will ship FOB San Francisco upon receipt of M.O. or certified check. Henry Hollwedel, 1036 Tahoe Dr., Belmont, Calif.

FOR SALE — Hallicrafters SX-71 receiver, fine condition, $115; 2-meter International crystal pre-amp., VFA-1, in perforated minibox, with tubes and cables to fit Gonset equip., $10. M. G. Weiman, 4514 Ave. K, Brooklyn 34, N. Y.

SALE — Lot of 100 FT243 crystals in ranges from 5675 Kc. to 8650 Kc., $20. M. Molyneux, 4551 Shadesview Dr., Mobile, Ala.

SELL OR SWAP — CREI correspondence course, 20 lessons basic radio, 50 advanced theory; Proc. IRE, June '54 - June '58. Best offer or swap for movie camera, C. F. McGregor, 7302 Elmhurst St., Washington 28, D. C.

TRADE OR SELL — Heathkit 0-10 scope; Heathkit AR-3 receiver. Will accept good automatic 35mm slide projector and screen. Raymond Carl, 1212 McCabe Ave., Coraopolis, Pa.

FOR SALE OR TRADE — Complete stock, supplies and equipment for small radio-TV shop. Write for list. Wayne Bryant, 2921 Forest Glen, Downers Grove, Ill.

FOR SALE — Dynamotor PE-101-C, input 6.3 v., output 300 v. at 100 ma., or, input 12.6 v., output 600 v. at 100 ma. DC, $5.50 plus postage. H. H. Van Dick, 5 Route 23, Wayne, N. J.

FOR SALE—NRI Radio-TV Service Course, will take $35 and ship, or $30 and you pay for postage. Set is in binders and like new cond. James Eberhart, Chief of Police, Parrott, Ga.

FOR SALE — QST dating from 1924 to 1945. Incomplete sets. Best offer. Send stamped self-addressed envelope for list. Cornelius G. Donati, Box 97, R.D. 3, Johnstown, Pa.

FOR SALE — Hallicrafters SX-99 receiver, $80; Gotham V-80 vertical antenna, $12; Eico 710 grid dip meter, $25; Eico 320 signal generator, $15; Electro-Voice mike 729, $10. All fine condition, with operating manuals. B. J. Duffe, 93 Michael St., Iselin, N. J.

FOR SALE — Morse code osc. (Insuline) and code records, $7.50; Allied Knight intercom, $7.50. John R. Willis, 84 East Shore Rd., Indian Lake, Denville, N. J.

WANTED — Westinghouse Aeriola Jr. crystal set in good cond. Pay cash, or will trade like new 2¼ x 2¼ f4.5 German reflex camera, or new Phaostron VOM tester. A. A. Goodman, 6471 Milton St., Philadelphia 19, Pa.

CASH OR TRADE — For low-priced test equipment and TV books. State price, age, and model. Will sell or trade Precision Series 920 Electronamic tube and set tester. R. B. Johnson, 3922 W. 108 St., Inglewood, Calif.

FOR SALE — Weston 772 analyzer multimeter, $25; power supply for RX10,000 resistance range, $5 extra. Irving Schreier, 136-17 Jewel Ave., Flushing 67, N. Y.

FOR SALE — Three BC-445B; one BC-454A receivers; four BC-459A, one BC-458A transmitters. Ask for list. Roy H. Bender, 250 W. Ferdinand St., Manheim, Pa.

FOR SALE — NRI Radio and TV course with radio and cabinet, $25 plus shipping. George J. Rupp, 6009 Falkirk Rd., Baltimore 12, Md.

TRADE — Ciroflex camera with case, f3.5 Wollensak lens (needs shutter), for new TV tubes, or what have you. R. Price, 2337 Walton Ave., Bronx 68, N. Y.

WANTED — Schematics or instruction books for Lysco 600 and RAS-3 (HRO-Jr.). Will buy or rent. Also want test equip. bargains. J. W. Craps, 1340 Gabriel Dr., Norfolk 2, Va.

FOR SALE — Hallicrafter SX-71 with instructions, less speaker, $125 FOB; Webster 178 wire recorder, $30; Harvey-Wells Bandmaster power supply, $21. All in good condition. M. G. Moses, 1509 Coles Blvd., Portsmouth, Ohio.

FOR SALE — Collins 75A2, 32V2, typing reperforator, 813s linear amplifier, transmitting tubes, condensers, radio books and magazines. F. G. Schmidt, 405 N.W. 30 Terr., Ft. Lauderdale, Fla.

SELL OR TRADE — National Radio and TV Repair Course with kits or separate. Never used. Will swap for good SW commercial receiver, $50 prepaid. Charles Flanary, 217 W. R.R. St., Pennington Gap, Va.

WANTED — 1948 or 1949 ARRL Handbook, QST's 1950 to 1952; small 5 or 10 w. six meter transmitter. Please state cond. Ronald J. Melancon, Box 222, Cloquet, Minn.

FOR SALE — Hickok 209A VTVM, about $90, and Hickok signal generator 288X, $60. L. Seidner, 825 Forest Ave., Deerfield, Ill.

FOR SALE — TV projection tubes, GSAP 16mm movie camera, chokes, racks, misc. Peter J. Donneau, 11 Blanche Ave., Manville, R. I.

FOR SALE — Simpson 215 VOM, fine condition, carrying case, new batteries, $20 FOB. R. R. Linville, 2818 Glenn Ave., Winston-Salem, N. C.

FOR SALE — Best offer: Eico TV-FM sweep generator and marker, 368; Radio City flyback transformer and yoke tester 123; Radio City multitester 660. All factory wired. C. Servais, 4774 Falmouth, Shawnee Mission, Kansas City, Kan.

FOR SALE — Marantz audio consolette, fine condition, $85; Pickering Unipoise pickup arm with diamond needle, $20; Concertone 33, still in factory carton, $750; Geloso G-255-S recorder, like new, $85. Sam W. Fisher, 594 South Ave., Bridgeton, N. J.

SELL OR TRADE — Complete Watchmakers set-up: lathe, all attachments, materials, cabinets loaded, nearly new, for TV supplies or equipment, or what have you. J. G. Lynch, 1412 Kimberly Rd., Twin Falls, Idaho.

SELL OR SWAP — GE 200 & 210 series micro-miniature relays, stereo 4-tra. record play & erase heads, tweeter, Garrard turnable stereo wired, Reko-Kut record cutter. Want sig. generators, transistor tester, scope, electronic switch & harmonic distortion analyzer. A. Brandwein, 306 W. 100 St., N. Y. C.

WANTED — Technical, medical, and investment books and courses. Also have several items to swap. Will pay cash for good late model tape recorder. J. T. Wentworth, P.O. Box 1585, Mobile, Ala.

FOR SALE — Magazines: Electronics 1938-60, Radio Engineering $3 a year; Short Wave & TV, Radio & TV, Short Wave Craft, Radio Electronics, Radio News, FM & TV, etc. 10 cents each plus postage. Telelab, 57 Harrison Ave., Saugus, Mass.

FOR SALE — Collins AM-FM tuner, $70; Hickok VTVM 209A, $120; AM-FM generator 277X, $225; Heathkit scope 0-7, needs repairs, $20; GD-1B $15. All in good cond. Mr. Salmento, 1950 AACS SQ, Box 127, APO 231, New York, N. Y.

FOR SALE — CW and phone 500 w. transmitter and 6 ft. rack, 813 final, VFO control, 3 to 30 Mc., built-in scope and panadapter, phone patch, variac controls, operating control, complete, $200. Write. A. Zawediuk, 1316 Woodbine St., Bethlehem, Pa.

TRADE — For U. S. coins: Viking xmtr., Knight VFO, G4ZU minibeam 10-15-20M, 20A with 10 to 80M VFO, 900 w. power supply; SG8 sig. gen.; AM-1 antenna-scope; master mobile whip with coils and base mount, etc. Louis L. Wright, 1421 Wellesley, St. Paul 5, Minn.

WANTED — Old loop antennas, radio parts, books, such as E. I. Company, etc. Write to Wilbur E. Peatfield, 228 Havre St., East Boston 28, Mass.

WANTED — Cabinet for FADA broadcast radio, Model 1000. Robert H. Decker, 3441 Millrich Ave., Cincinnati 11, Ohio.

WANTED — 6 and 12 v. 2-way radios and transmitters, for 22 and 37 Mc. W. H. Norman, 130 N. Douglas Ave., Rockwood, Tenn.

WANTED — Philco 71-G1 chassis for parts. Must be in good condition. J. W. Landon, Wayne, W. Va.

WANTED — TeCraft 6 and 12 meter converters with 26-30 Mc. IF output. CC-144 and CC-50. W. Zmetronak, 147 Farview Ave., Paramus, N. J.

SELL — Hickok 288X sig. gen., fine cond., $200; Johnson Viking II with push-to-talk built in, VFO-122, fine cond., $235.50; brand new HQ-145 with crystal calibrator, $242.50; or best offers. Albert Johnson, 55 Pinnacle Rd., Newport, N. H.

WANTED — ARRL and Radio handbooks, BC-453 and comm. receiver in any cond. Marvin Gurlin, 111 White Horse Pike, Audubon 6, N. J.

FOR SALE — Hickok VTVM 209A; Precision generators E-200C and E-400; scope, ES-500; tube tester 612; field kit with Precision tube tester; CRT tester; misc. tubes, parts and equipment. V. J. Lewis, Jr., 210 Woodworth Ave., Yonkers, N. Y.

SWAP — 110 v. motors, speakers, ¼" electric drill, phono motors, rotor, furnace conversion unit, cameras, HO train equipment, other items. Need bugle, old Army type, metal locator. Thomas Rohland, RR 3, Martinsville, Ind.

SELL OR SWAP — 30 w., 12 v. Motorola transmitter and receiver, FM now on, 37 Mc., complete with all accessories. Want 27 Mc. citizen 6 and 117 v. units or $250. John Runyon, PO Box 241, Oakdale, N. Y.

FOR SALE — 150' tape recorder head-alignment tape, $2 postpaid. W. A. Banton, 504 Higuera St., San Luis Obispo, Calif.

FOR SALE — Elmac A54 transmitter; Morrow 5BR converter with separate IF strip. Both with orig. instruction books, 6 v. dynamotor, 400 v. at 225 mils constant duty. Want SB10. Currin L. Skutt, 119 N. Foster St., Lansing 12, Mich.

TRADE — Custom deluxe 1956 Chevy radio 987575, complete, orig. carton, for high quality SLR camera or photo equipment. Have RT-75 Bell tape recorder, like new, $100 FOB. Jeff Rish, Jr., Pontotoc, Miss.

FOR SALE — Ferrograph 66 professional tape recorder, $200; Viking 75 tape deck dual track record-monitor-playback; 4-track stereo playback, with 3 Viking preamps, in deluxe portable case, $200. Riverdale, Box 173, Waltham 54, Mass.

FOR SALE — Heath TC-3 tube checker, fine cond., instructions, CRT adapter, $40; Heath C-3 condenser checker, $15; Weston OCL tube analyzer, needs work, $25 or trade for books; Superior utility tester, $12; Hallicrafter TV tuner 506 early. Larry Stillman, 1914 Dixie St., Oceanside, Calif.

SELL OR TRADE — Like new Maxwell citizens band 2-way radios, 2 complete stations, other parts and accessories, $225 cash, or trade for pistols, Colts, Lugers. Herman Senn, Jr., Rt. 4, Box 194-C, Monroe, La.

FOR SALE — Three surplus unused G.E. motor generators, in very good cond., input 28 v. DC, 100 amps. max., output 115 v. AC, 400 cycle, 1500 VA, 1 Hp., $75 each. Robert B. Karr, 2002 Snow Dr., Alamogordo, N. Mex.

WANTED — to rebuild, Triumph 841 or Navy OBL-3 oscillograph, with front panel, case, chassis, parts, light and tube shields must be in good condition and complete. James W. Hoskins, 592 Laswell Ave., San Jose 28, Calif.

WANTED — CQ magazines for cash or swap old QSTs. R. G. McGhee, 5515 Grauer Rd., Niagara Falls, N. Y.

SWAP — 16mm sound film, ½ hour run, Big 10 collegiate football; 3 - 812A RCAs; 4 - 866A Uniteds; one 2" DC 0-200 MA; one 3" AC, 0-10 amp. All tubes and meters. Richard Overholt, 130-16th Ave., San Francisco 18, Calif.

WANTED FOR CASH — Instruction manuals, schematics and books pertaining to Teletype (RTTY) oper. Please state price and condition. William E. Barrett, 2828 So. Ninth St., Sheboygan, Wis.

FOR SALE — Leeds & Northrup rack on casters for mounting 3 Model S instruments, $25; Approved Electronics Model A-460 field strength meter, like new, $50; Dumont 247 scope, 130 lbs., 30 tubes, with manual, $100. W. E. Warner, 5358 Big Tyler Rd., Charleston 2, W. Va.

SELL OR TRADE — Hickok 288X signal gen., good cond., checked and calibrated by Hickok factory, $65, or trade for good factory wired scope. Sams Photofacts, Vol. 1 thru 8, 80 sets in all for $64 cash or ship anywhere COD, no binders. Ted Morton, Granite Quarry Electronics, Granite Quarry, N. C.

FOR SALE — Gonset 2M Communicator, 110 v. AC, 6 v. DC, push-to-talk, fine cond. Best offer. Mitchel Katz, 147-11 76th Ave., Flushing 67, N. Y.

WANTED — Professional quality microscope with oil immersion lens and Abbe condenser. Will pay cash or trade for electrical and/or electronic instruments. Advise brand, model number, condition and price. D. Kurs, 775 Plympton St., New Milford, N. J.

URGENTLY NEEDED — Dial scale glass for Motorola chassis HS-316 from TV model 21F1. All letters answered. Will buy comp. radio if necessary. Harold F. Houtz, 1120 E. 7th Ave., Kennewick, Wash.

WANTED — RCA 89A marker generator and RCA 59C sweep gen. State price and cond. Sam Ellison, 618 N. Lake Parker Dr., Lakeland, Fla.

FOR SALE — One pair 1625 and one pair 832-A tubes, $15 both pair; Universal Instrument 502 tube checker, ohmeter and battery tester combined, $15 FOB. Jim Hackett, 2211 Lyell Ave., Rochester 6, N. Y.

FOR SALE — Old wall type telephones, in working order. Can ship from Virginia or Kansas, closest point, $12 each incl. postage. Vernon Schmidt, 1423 Grace St., Charlottesville, Va.

WANTED — Radiola I and other antique radio and wireless gear; early radio magazines. Will swap for other antiques or pay cash. Paul Giganti, 2429 San Carlos Ave., San Carlos, Calif.

SELL OR SWAP — Gibson stereo, electric Spanish guitar and case, large Gibson amplifier for cash, TV, or tape recorders. Dan Bruno, 28 S. Bow St., Milford, Mass.

WANT — Lampkin 105-B frequency meter and 205A modulation meter, in good condition. Edwin A. Gruneich, Hunter, N. Dak.

WANTED — Coronado 35RA2-43-5101A Universal mount auto radios; Eico 425 5" scope. State cond. and price. George Russell, RFD 2, Pulaski, Tenn.

FOR SALE — QST, 1938, Jan. thru July 1947, 1951 thru 1958 inclusive, 30 cents per copy or complete year, $3. 115 issues, $125. Postage prepaid. Reid H. Burrows, 1340 Apple Tree Lane, Brookfield, Wis.

FOR SALE — Collins 32-RA transmitter, $25; Hallicrafters S-27 AM-FM rcvr., $25; Bendix RTA-1B transmitter-receiver, $15; PE-103 dynamotor, $8; transmitting tubes. Will not ship. J. D. Andrew, 65 Ridgley St., Mt. Holly, N. J.

FOR SALE — Very reasonable, Motek, British-made 3-motor monaural tape deck for 117 v. AC, in original shipping carton. W. A. Toepel, 70 Washington Ave., W. Caldwell, N. J.

WANTED — Coils for HRO or RAS receiver, any model, or parts for same. Also TU16 and TU17 for APR4 receiver. W. O. Wesslund, Rt. 2, N. Platte, Neb.

WANTED — Good used professional two-way service equipment. Need certified accurate freq. meter and FM modulation meter. Don Albert, 508 E. Fourth St., Hutchinson, Kan.

FOR SALE — Home brew 850 w. transmitter in 6 ft. enclosed rack. Sale must be local. Write for information. Samuel Lieberman, 130-29 228th St., Laurelton 13, N. Y.

FOR SALE — Revere tape recorder T-1100 with 6 tapes, $90; Heath FM-3A tuner, EA-3 amplifier, $45, or all for $125 FOB. John J. Ruskey, 32 Crescent St., Bradford, Mass.

FOR SALE — 2 Fisher 100 amplifiers, never used, $85 each; Fairchild 282 arm with 232 cartridge, $35; Fairchild 280A arm with 225A cartridge, $25; Lear LTRA-6 transceiver, $200. Roland S. Bond, Jr., 7008 Forest Lane, Dallas 30, Tex.

TRADE — B&W 425 (52 ohm), or 426 (72 ohm), low-pass filter plus cash or gear for Bud LF 601A, low-pass filter. Arthur Ideker, c/o Ark. Power & Light Co., Pine Bluff, Ark.

SELL — Superb Eico 720 transmitter, plus 730 modulator, wired by CBS engineer, like new condition, $160. M. G. Weiman, 4514 Ave. K, Brooklyn 34, N. Y.

FOR SALE — NC-240D receiver with manual and speaker, $110; 4x5 Graflex with flash, revolving back, magazine back (cost $35), pack back (lens cost $35), used for commercial color, not pretty but works, $30 FOB. J. Sears, Middlebury, Vt.

SELL OR SWAP — Publications: High Fidelity, 26 thru 91; past five years of Audio and Radio & TV News. Many others. 25% of face value takes all. 15" Karlson kit, $12. Will trade for top grade lab test equip., any cond. R. Hirsch, 2178 Merokee Drive E., Merrick, N. Y.

WANTED TO BUY — Used correspondence courses; computers, International, Philco, Berkleys; old math. textbooks (all areas of math); slide rule; used Post 10" versalog or Post pocket size 5" versalog. R. Taylor, 6672 Humboldt, Westminster, Calif.

FOR SALE — Hickok 156 Traceometer, like new, $55; RTTA Radio & TV Repair course with VOM kit, $40; Jackson 648 tube tester, $50; 8mm fl. 4 telephoto with 2 filters and leather case, like new, $21; Elements of Radio, $2; TV Simplified, $2. J. Wilson, 1687 Daley Rd., Lapeer, Mich.

WANTED — Electrovoice speaker components, 15 w., T-350, T-25A, 8-HD and X-336. Have TS-175/U; Federal 804 sig. gen.; variable vacuum cond's.; 4-125A's; 4X150A's, parts and meters to trade. Gillia Wood, RFD 1, Shawnee, Okla.

SALE OR TRADE — Electronics course; Nilson's Master Course in Radio Communication, by CIRE, **incl. 18 books, 3** vols.; 3 books in 1 vol. on Specialized TV Engineering Course for 6 mtr. transceiver. Robert D. Vosbury, 38 Andrews Ave., Binghamton, N. Y.

WANTED — Hallicrafters S-37 receiver; transmitter, medium power voice modulated with power supply, similiar to Viking or Globe Scout or good home brew. Peter Dal Corobbo, 10441 Corliss Ave., Chicago 28, Ill.

FOR SALE — CT100 color TV; Motorola table TV, 22 lbs.; 1928 Bosh radio chassis, 11 tube superhet orig. spkrs. crossover; 42-50 Mc. tuner, TG10 code keyer; ARB rcvr 7JPA, 5A90 Dukane outdoor spkrs. John S. Petrek, 373 Lewis Seifert Rd., Hubbard, Ohio.

URGENT — Want copy of Electrical Engineers Handbook, small pages about 4" x 5½", any edition, 1945 to 1955 Will trade New Revised Meters, How to Use, Rider. Electronic Engineering Lab., 2506 W. Grace St., Richmond 20, Va.

FOR SALE — RCA lightweight pick-up head L2.5; pair RCA Universal pick-up heads with diamond stylus; Presto 1-D cutter head; Wollensak-Dumont 7" f2.8 TV Balop and pair Simpson 7" anastigmat TV projection lens. Best offer. Geo. Smith, 915 Lovera Blvd., San Antonio, Tex.

WANTED — 7x35 binoculars, KWMII, high quality tape deck with record amp. and stereo playback. Kenneth M. Miller, 14979 La Cumbre Dr., Pacific Palisades, Calif.

WANTED — BC-348Q; AN/URM-17; AN/APR-4 or equiv. Ben Salavin, Center TV Co., 867 Broad St., Central Falls, R. I.

FOR SALE — Craftsman "500" power amplifier; Eico pre-amp. hardly used. J. J. Ortiz, 32-15 35th St., Astoria 6, N. Y.

SELL OR SWAP — Webster Chicago wire recorder, good cond., AC cord and mike, $30 or ham gear. J. Peterson, 1240 Franklin Ave., Bronx 56, N. Y.

WANTED — Commercial test equipment, catalogs and tubes, any type. D. Kantrowitz, 245-16 62nd Ave., Douglaston, Queens, N. Y.

WANT — All kinds of microwave tubes and equipment, for special ham project. A. B. Rose, 101 W. 81st St., New York, N. Y.

WANTED — Sams Photofacts, fairly complete set. State price and cond. Local only. Kenneth Duckett, 149 Morumbega Dr., Monrovia, Calif.

MUST SELL — Eico 720 90 w. CW transmitter. Completely wired, never used, $65. Harvey Watkins, 1520 Sheridan Ave., New York 57, N. Y.

FOR SALE — Riders Manuals, 11-14, 16, 18-22. Also assembled Heath test equip. Make offer or trade. Richard Matto, 412 Meritta Ave., Beaufort, S. C.

FOR SALE — Riders Manuals from 11 to 20, good shape, for best offer. Wilson Radio Service, Box 535, Altavista, Va.

WANTED — Heath "Sixer", C.B. gear, transistor portable, transistor powered radio fit Volks Microbus. Gear need not be working but complete. Have good Eico 324 sig. gen., Heath Q multiplier. Ed Borowicz, 1023 Madison Ave., Elizabeth, N. J.

FOR SALE — Used Hickok 600 Dyn-mutual cond. tube tester, with instructions, in very good cond., $41.85; RJXO70 GE VHF tuner, RLD069 G.E. yoke, RTP-331 GE power transformer, $7.85. Warren J. Castex, R. 1, Box 118, St. Martinville, La.

FOR SALE — Heath QF-1 Q mult., $5; Type 913 1" scope tube, $2.50. E. J. Wolitzer, 2143 82nd St., Brooklyn 14, N. Y.

FOR SALE — Hickok 156 traceometer, $20, or swap for Heathkit VTVM; Burke and James 2¼ x 3¼ press camera, f2.9 lens, flash, holders, etc., $75, no trade. R. T. Beck, 1305 Jefferson St., Racine, Wis.

FOR SALE — Hickok Traceometer model 155 with instruction manual and probes; Precision Hi-Freq. probe model RF10 for EV10 VTVM; high voltage probe with multiplier for use with Precision EV10 or 98 meter. G. S. Preston, G. & E. Radio Shop, Hamilton, Va.

WANTED — General Radio 617-C oscillator. Jack Berman, 28 New Haven St., Boston 32, Mass.

WANTED — Field strength meter for cash. John Fau, 2825 S. Harvey Ave., Berwyn, Ill.

FOR SALE — Knight model 83Y784 12 w. HiFi amp., and Don McGohan MG-10-C 10 w. PA amp. Both in excellent condition. Make offer. Brad Gjerding, 7313 25 Ave. N. W. Seattle 7, Wash.

FOR SALE OR TRADE — Warner 10 amp. electroplater, 5 gal. plating tank, motor driven agitator and complete course in Baby Shoe plating. Was $130. Make offer or trade for ham gear. Edwin L. Sheldon, Box 721, Aberdeen, S. D.

WANTED — Schematics for Bendix TV rcvr. 2070-U; Zenith Trans-Oceanic radio rcvr. G500, chassis 5G40; Bendix 736-B radio rcvr. G. E. Gunter, 4433 Ardale St., Sarasota, Fla.

WANTED — Used RF induction heater or transmitter to convert to same. S. Henry, 811 Grant St., Peru, Ill.

FOR SALE — Precision ES-500 scope, $50; TBY-8 and Abbot TR-4 transceivers, $15 each; AF-FM-SW chassis, $15. All good cond. Jay Engleman, 22 Plympton St., Cambridge 38, Mass.

WANTED — Schematic or manual for "Time-O-Scope" model J, serial No. 1012, Timing Instrument Co., New York, N. Y. Raymond Dodge, 676 Verde Vista Ave., Pomona, Calif.

FOR SALE — Lakeshore Time-Master, $6.60, like new; Drake TV-100-LP low-pass filter with female connections, $5.25; Nelson TVI book, $1.25. Robert W. Sherman, 8871-20th Ave., Brooklyn 14, N. Y.

WANTED — Alliance U-98 control box only. State price and condition. Paul Goff, 1220 Franklin St., Johnstown, Pa.

WANTED — Manual for DuMont 256-D or E oscillograph. Quote price. M. F. Labuda, 8934 E. Beatrice Pl., Rosmead, Calif.

FOR SALE — Ciro-flex 2¼ x 2¼, f3.5 lens, to 1/400 sec., flash sync. needs repair; Kalart Deluxe flash with test lamp, series VI adapter ring, lens shade, two filters, close-up lens, $30. Arthur Waldbusser, 490 Linwood St., Brooklyn 8, N.Y.

FOR SALE — Gonset Commander mobile xmitter, $85; Gonset Super 12 mobile converter, $40; 10 meter whip, $5; 12 v. dynamotor, $12. Want multiphase MM-2, coils for HRO50-T1, all-band vertical. Phil Snyder, 514 Fellows Ave., Syracuse 10, N. Y.

FOR SALE — Radio-TV News, April '47 to Nov. '60, $12; 2 complete power supplies: (1) 520-0-520 (300 ma) (1) 460-0-460 (150 ma) with two 5 v. and two 6.3 v. sec., chokes, oil condensers and bleeder resistors, $15; 7JP4 pix tube. $2. Matthew Socha, 492 Von Elm Ave., E. Meadow. L. I., N. Y.

FOR SALE — National HRO-7 comm. receiver, short wave, complete, very good cond., $100; Zenith AM and shortwave chassis plus 78 rpm turntable, $15; Arco ¼" drill saw, extra blade, $5; as is — 7" TV, $5; 10" TV, $10. A. C. Gary, 378 W. Palisade Ave, Englewood, N. J.

FOR SALE — Sprague T-04 condenser tester, like new, with instruction book, $45; Mallory battery eliminator 0-10 v., 0-30 amps., $20. James Lawless, 636 Pleasant Valley Pkwy., Providence, R. I.

BUSINESS FOR SALE — Good income-producing Radio-TV Service business in same town for 30 years. Retiring only because of health. Right price to the right man. Homer Gray, 223 N. Chestnut St., Morrilton, Ark.

FOR SALE — Heath HW-19, 10 meter transceiver with built-in meter, $32, good condition. John Morrice, 57 Rockaway Ave., Rockaway, N. J.

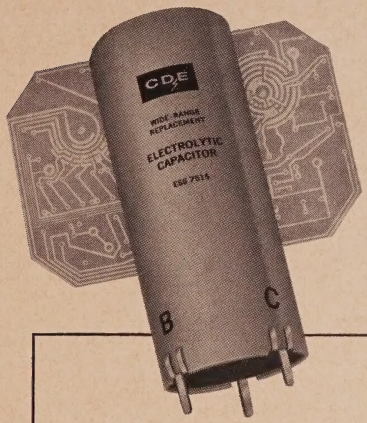
FOR SALE — Motorola TS-30 TV tuner, $7; pwr. transformer, $7; dflection yoke, $5; RCA portable radio, BP10, perfect, less batt., $8; and auto radio, old 2 unit 6 v. cable type, playing condition, $6; 21" Raytheon TV, $35. Carl Brinkmeier, 3431 Alberta St., St. Louis 18, Mo.

SELL OR SWAP — Used and unused Clarostat 30 ohm wire wound potentiometers with DPST switch. L. Buddine, 1700 W. High St., Haddon Heights, N. J.

CORNELL-DUBILIER

WIDE RANGE

ELECTROLYTIC CAPACITOR TYPE ESS-7515



SPECIFICATIONS

Case Size — 1" Dia. x 2½" Long
Overall — 1" Dia. x 2¾" Long
Printed Board Mounting Lugs

DUAL SECTION UNIT:

Lug A — Common Negative
Lug B — 40-80 Mfd. 150 WVDC
Lug C — 30-60 Mfd. 150 WVDC

Here's probably the most versatile SINGLE UNIT (2 section) Electrolytic Capacitor ever to come to the aid of the Radio and TV Service Technician.

This compact, ESS-7515, cardboard sleeved single unit provides an EXACT electrical and mechanical replacement for 8

Original Standard 150 WVDC Capacitors

as used principally in printed circuit home radio receivers . . .

50-30 Mfd.	**80-40 Mfd.**
70-30 Mfd.	**50-50 Mfd.**
75-30 Mfd.	**70-50 Mfd.**
60-40 Mfd.	**80-50 Mfd.**

In addition, the versatility of the ESS-7515 makes it an ideal replacement for many combinations of capacitance, within its ratings, beyond the 8 mentioned above. For example:

It will replace—any SINGLE section unit rated between 40 and 80 Mfd. at 150 WVDC; *or* — any SINGLE section unit rated between 30 and 60 Mfd. at 150 WVDC; *or* — any SINGLE section unit rated between 30 and 140 Mfd. at 150 WVDC *and many more.*

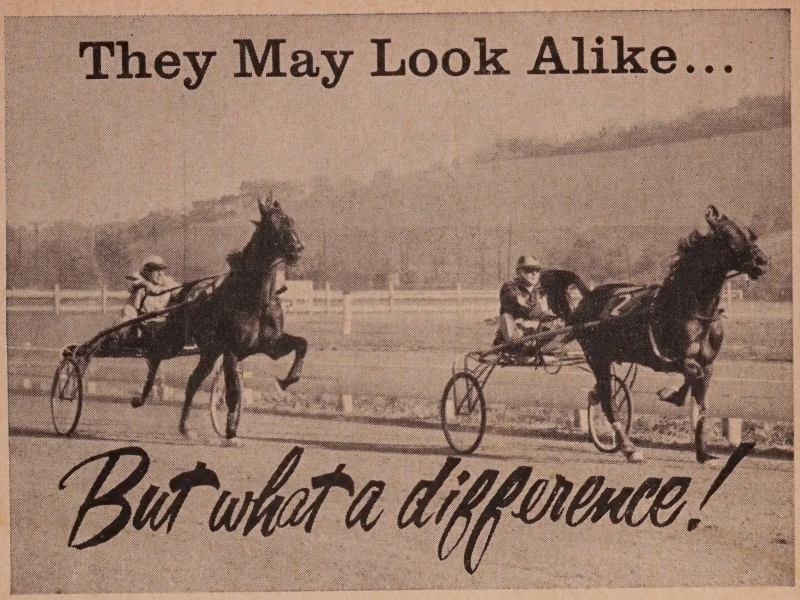
The ESS-7515 is designed especially for printed board mounting. The mounting lugs can also serve as solder terminals for conventional sub-chassis capacitor replacements.

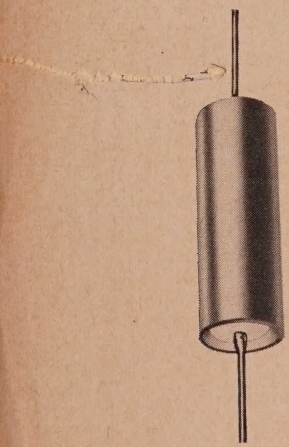
A modest stock of ESS-7515's provides an ever-ready answer for a multitude of service replacements.

at all Authorized CDE Distributors *NOW!*

CDE **CORNELL-DUBILIER CAPACITORS**

They May Look Alike...





It's the same with capacitors. Others may look like CDE tubulars, but only CDE's have the built-in extras that are the result of 50 years of capacitor leadership. Next time you buy capacitors, insist on performance. Insist on CDE . . . *by name!*

TYPE TWMA (DEMICON)

Hermetically sealed with glass-to-metal seal terminals, this miniature metal-cased Mylar* tubular is built to give long-lasting performance.

There are more CDE Capacitors in use today by far — than any other make.

Don't gamble — specify CDE

CDE **CORNELL-DUBILIER CAPACITORS**

*Du Pont Reg. T.M.

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